A Cleaning Appliance

This invention relates to a cleaning appliance, such as a vacuum cleaner.

Cleaning appliances such as vacuum cleaners are well known. The majority of vacuum cleaners are either of the 'upright' type or of the 'cylinder' type (called canister or barrel machines in some countries.) An example of a cylinder vacuum cleaner manufactured by Dyson Limited under the name DC05 ("DC05" is a trade mark of Dyson Limited) is shown in Figure 1.

Cylinder vacuum cleaners generally comprise a main body 10 which contains separating apparatus 11 such as a cyclonic separator or a bag for separating dirt and dust from an incoming dirty airflow. The dirty airflow is introduced to the main body 10 via a suction hose 15 and a wand 16 assembly which is connected to the main body 10. The main body 10 of the cleaner is dragged along by the hose as a user moves around a room. A cleaning tool is attached to the remote end of the hose and wand assembly.

Cylinder vacuum cleaners are often perceived to have a disadvantage of being difficult to store. Although the main body of the cleaner is usually fairly compact, the suction hose and wand can take up a considerable amount of space. One of the reasons for this is that the suction hose has a robust construction which is sufficiently tough to allow the hose to pull the main body along, and to withstand abrasion during use. This robustness can make it difficult to store the suction hose.

There have been various proposals for storing the suction hose of a cylinder type of vacuum cleaner. US 883,413 shows a vacuum cleaner with a cylindrical casing. The long suction hose is stored by coiling it a number of times around the periphery of the casing. An annular trough is provided near the base of the casing to support the

lowermost coil of hose and a clip is provided at the top of the casing for supporting the suction nozzle.

US 5,742,976 shows a vacuum cleaner in which the outer circumference of the main body has a groove for receiving a suction hose. When the hose needs to be stored, the hose is placed in the groove and is held in place by virtue of the distal end latching to the main body.

In the vacuum cleaner shown in US 4,563,789, a suction hose is stored on top of the upper face of the cleaner by coiling the hose several times around the upper face. A connector is provided for securing the two ends of the hose together and thus for retaining the hose on the machine.

US 3,170,185, US 3,480,987 and US 3,651,536 show vacuum cleaners where the suction hose is stored within the main body of the vacuum cleaner. While this solution can neatly store the hose, it requires the main body of the machine to have a chamber which is large enough to accommodate all of the suction hose. This has the disadvantage of increasing the size of the main body of the vacuum cleaner and hence making the machine more cumbersome to manipulate during normal use.

A different solution to the problem of storing the suction hose is proposed in EP 1 011 408, where part of the suction hose is stored within the tube which forms the wand.

The present invention seeks to provide an alternative manner of storing the suction hose on a cleaning appliance.

Accordingly, the present invention provides a cleaning appliance of the cylinder type comprising a main body and a hose for carrying fluid to/from the main body, wherein guide means are located on the main body for guiding the hose along a hose storage path which is a sinuous path around the periphery of the main body.

Expressed in another way, the hose storage path is non-planar. The height of the hose storage path, above a base of the main body, varies around the periphery of the main body. The sinuous storage path around the main body has an advantage of increasing the length of hose which can stored around the main body in comparison with a planar coil of hose around the body. This can increase the storage path sufficiently such that the hose only needs to be looped once around the main body. The sinuous path also has an advantage that the hose can be fitted more closely to the main body since the hose storage path follows the regions where storage space exists on the main body. Preferably the hose lies substantially within the envelope of the main body along most of its length, i.e. the hose does not protrude any further beyond the main body than other components, such as the wheels. Preferably, the hose storage path lies above the wheels so that the hose does not need to lie outside the wheels.

Preferably the guide means also retain the hose to the main body. The guide means can retain the hose at at least one, and preferably at least two, intermediate points along the length of the hose.

Although embodiments of the invention are described in detail with reference to a vacuum cleaner, it will be appreciated that the inventions can also be applied to other forms of cleaning appliance. The term "cleaning appliance" is intended to have a broad meaning, and includes a wide range of machines having a main body and a wand for carrying fluid to or from a floor surface. It includes, inter alia, machines which only apply suction to the surface, such as vacuum cleaners (dry, wet and wet/dry variants), so as to draw material from the surface, as well as machines which apply material to the surface, such as polishing/waxing machines, pressure washing machines and shampooing machines.

Embodiments of the invention will now be described with reference to the drawings, in which:

Figure 1 shows a conventional vacuum cleaner of the cylinder type;

Figure 2 shows a vacuum cleaner in accordance with an embodiment of the invention with the flexible hose fitted to the chassis of the cleaner;

Figures 3A and 3B respectively show a side view and a rear view of the vacuum cleaner of Figure 2 with the hose removed;

Figure 4 shows the wand of the vacuum cleaner of Figures 2, 3A and 3B in an extended state;

Figure 5 shows the wand of Figure 4 in a retracted state for storage;

Figure 6 is a cross-section through the wand while stored on the vacuum cleaner of Figure 2;

Figure 7 is a detailed view of the catch on the wand;

Figure 8 is a schematic plan view of the vacuum cleaner showing the storage of the hose;

Figures 9 and 10 are cross-sections of the hose storage channel;

Figures 11A and 11B show the hose location collar on the flexible hose;

Figures 12 and 13 show the securing mechanisms on the wand;

Figures 14 to 16 show alternative forms of the wand;

Figure 17 shows an alternative form of the main body of the vacuum cleaner;

Figures 18 to 23 show alternative forms of hose retaining schemes for the vacuum cleaner.

Figure 2 shows a cleaning appliance in the form of a vacuum cleaner. The vacuum cleaner has a main body 100 which supports the main components of the vacuum cleaner. In a traditional manner, the main body 100 has a chassis 110 which supports separating and collecting apparatus 120 and a motor-driven fan (not shown) for generating a suction which can draw dirt laden air into the separating apparatus 120. The main body 100 also has two main wheels 112, one on each side of the rear portion of the chassis 110, and a castor wheel 113 beneath the front portion of the chassis 110 which allow the main body 100 to be dragged along a surface. It will be understood that the wheels 112, 113 could be supplemented, or replaced, by other means for allowing the main body 100 to be dragged across a surface, such as skids. The form of the separating apparatus 120 is not important to the invention. While we prefer to use cyclonic separators which spin dirt, dust and debris from the airflow, other forms of separator can be used and examples of suitable separator technology include a centrifugal separator, a filter bag, a porous container, an electrostatic separator or a liquid-based separator.

In Figure 2, the separating apparatus comprises two generally cylindrical chambers 121, 122 which lie alongside one another. The chambers 121, 122 are connected to one another by a central spine 123. The separating apparatus 120 is removably mounted on the chassis for emptying and for access to components beneath the separating apparatus.

A flexible hose 150 and a wand assembly 160 connect to an inlet port 151 on the main body 100. The main body 100 of the cleaner is pulled along by the hose 150 as a user moves around a room. The hose 150 has a construction which is robust enough to withstand this pulling action, and any normal abrasion which may be encountered as the hose rubs against obstacles in a room.

In this embodiment, the air inlet port 151 is centrally mounted on the main body 100 at the forward, lower part of the machine. In alternative embodiments of the machine where the air inlet is not centrally positioned, such as the machine shown in Figure 1 where the inlet is near the upper part of the separating apparatus 11, it is preferable to anchor the hose 150 to the machine at a central position (as with anchor point 25 in the machine shown in Figure 1) so that when a user pulls the hose 150, the main body 100 follows the user.

Ducting on the chassis 110 connects the air inlet port 151 to an inlet to the separating apparatus 120. For a cyclonic separating apparatus 120, the inlet to the separating apparatus is arranged to guide incoming airflow through the wall of the chamber of the cyclonic separator in a tangential manner.

The second end of the hose 150 connects to the wand 160. A suitable wand assembly 160 is described in our co-pending International Patent Application PCT/GB02/00850. As shown in Figure 4, the wand comprises a set of three tubes 161, 162, 163 of progressively decreasing diameter. The tubes 161, 162, 163 can telescope inside one another and are retractably housed inside a storage tube 165. The three tubes 161, 162, 163 are slideable inside one another and can be moved between a stored position (as best shown in Figure 6) and an extended position (as shown in Figure 4) in which one tube is extended from another such that only the ends of the tubes overlap one another. Securing mechanisms 400 secure the tubes in an extended position, as will be described more fully below. Tubes 161, 162, 163 are progressively longer in length. The length of each tube is chosen so that it fully occupies the available space within the storage tube 165 when the securing mechanisms 400 are lying alongside one another.

The distal end of tube 163 has a connector 280 which is adapted to receive a floor tool, such as the floor tool shown 20 in Figure 1, in any known manner. For example, the floor tool can be connected to the tube 163 by means of an interference fit, interconnecting bayonet fittings, snap-fit connections, a screw threaded collar and sleeve,

or by any other suitable means. Accessory tools may also be fitted to the tube 163 in place of the floor tool. A handle 200 is connected to storage tube 165 to allow a user to manipulate the wand 160. Flexible hose 150 extends from one end of the storage tube 165 and is connected to the storage tube 165 by an outlet connector 168 which is rotatable about axis X-X', as shown in Figure 5. This part of the wand is described more fully in our International Patent Application WO 01/50940.

For ease of storage, and ease of carrying, the wand assembly 160 can be fitted to the main body 100 of the vacuum cleaner, as shown in Figures 2 and 3.

As best seen in Figure 3A, the length of the storage tube 165 is substantially equal to the length of the part of the main body 100 against which the wand is stored. In this manner, the wand 160 does not protrude too far beyond the main body 100 when it is fully retracted and stored on the main body 100.

As best seen in Figure 6, the wand 160 is stored alongside the uppermost surface of the main body 100. Figure 6 shows a cross-section through the wand 160 and the upper part of the separating apparatus 120 taken along the longitudinal axis of the vacuum cleaner. In this embodiment the upper surface of the separating apparatus 120, which itself is releasable from the remainder of the chassis 110 for emptying, is the part of the main body against which the wand 160 is secured. Fittings on the storage tube 165 of the wand assembly cooperate with complementary fittings on the upper surface of the separating apparatus 120 to retain the storage tube 165. The lower end of the storage tube 165 has a hooked projection 220 which extends outwardly from the tube 165. The hook 220 can locate beneath a hook 130 on the separating apparatus 120. This pair of hooks 220, 130 provides some mechanical support for the wand 160 during carrying, and also helps to properly locate the wand 160. The majority of the mechanical support is provided by a locking catch at the other end of the storage tube 165. The locking catch comprises a movable catch ring 222 with a catch face 225 and is shown in more detail in Figure 7. The catch face 225 locates beneath another hook 135 on the upper face of the

separating apparatus 120. The locking catch mechanism comprises a catch ring 222 which is pivotably mounted about the outside of the storage tube 165 about pivot point 223. The lower part of the catch ring 222 carries a catch face 225 for engaging with the main body. The catch ring is biased, by spring 241, into the locked position shown in Figures 5 and 6. An actuator member 235 is pivotably mounted to the storage tube 165 about pivot point 236. The actuator member 235 has a part which serves as a button 230 which can be operated by a user. The actuator member is biased by a spring 242 into the position in which it lies alongside the tube, as shown in Figures 2, 3A, 5 and 6. Actuator member 235 has an arm 237 on each of its sides, the end of the arm 237 locating within a notch 238 on the catch ring 222. In use, movement of the actuator member 235, by a user pressing button 230 in clockwise direction 239, causes arm 237 to urge catch ring 222 in an anti-clockwise direction about pivot point 223 to release catch 225. Actuator member 235 also has two further locking functions which are simultaneously achieved when button 230 is pressed. Firstly, the furthest end of the actuator member has a hook 231 which can engage with the connector 280 on the end of the tube 163. When all of the tubes 161, 162, 163 have been retracted into the storage tube 165, connector 280 lies alongside the end of storage tube 165 and hook 231 can hook onto connector 280. All of the tubes 161, 162, 163 are held securely within storage tube 165 until the actuator member 235 is operated to release the hook 231. The leading edge of hook 231 has an inclined face which can be displaced by the leading edge of connector 280 as the tubes are retracted inside the storage tube 165. This allows the hook 231 to automatically ride onto, and thus retain, the cap 280 as the tubes are moved towards a stored position. Connector 280 has a cap which, in the stored position (best shown in Figure 6) accommodates all of the securing mechanisms 400 of the tubes and thus serves to protect them from damage during storage.

Another feature of the locking mechanism is that projection 232 on the actuator member 235 can seat itself in a depression in the wall of tube 161 to lock the position of tube 161. Operating the actuator member 235 raises the projection 232 from its seated position and thus allows tube 161 to be moved. Tube 161 has a series of similar

depressions 233 along its length. Projection 232 also serves to secure the tube 161 in a desired extended position with respect to the storage tube 165.

It will be appreciated that operation of the single button 230 simultaneously releases the wand 160 from the main body 100 of the vacuum cleaner, releases the end connector 280 which in turn allows the tubes 161, 162, 163 to be withdrawn from the storage tube 165, and locks tube 161 in a selected extended position.

The method of operating the vacuum cleaner will now be described. To store the wand a user brings the storage tube 165 of the wand assembly, in its fully retracted state, alongside the uppermost face of the main body 100 and engages the hooked projection 220 behind hook 130 on the main body. The user then pivots the storage tube 165 towards the main body so that the catch face 225 engages with the hook 135 on the main body. The inclined shape of the catch face 225 causes the catch ring to move away from the hook 135, against the bias of the spring, as the storage tube is pushed against the main body, and to reseat itself beneath the hook 135. At this point the wand 160 is now fully locked in position on the main body 100 and a user can then use the handle 200 on the storage tube 165 of the wand assembly to carry the vacuum cleaner.

A floor tool can be left in place on the end of the wand 160 or it can be removed and stored elsewhere on the main body 100.

To release the wand 160 from the storage position, a user operates the button 230 to move catch ring 222 and catch face 225. This releases the catch face 225 from the hook 135. The user can then pull the wand 160 away from the main body and slide the wand upwards, to remove the hooked projection 220 from the main body 100.

The position in which a user will naturally feel comfortable grasping the handle 200 to lift and carry the vacuum cleaner is different to the position in which a user will wish to grasp the handle 200 to operate the wand for cleaning. In this embodiment, the handle

200 extends for some distance along the length of, and parallel to, the longitudinal axis of the storage tube 165 so as to provide the user with comfortable, longitudinally offset, positions for both carrying the vacuum cleaner and operating the wand for cleaning. Portion 205 of the handle, adjacent the end of the storage tube 165, is intended to be used to manipulate the wand during normal cleaning. Portion 205 lies at an angle to the longitudinal axis of the storage tube. This angled position, together with the position adjacent the end of the storage tube, has been found to be a comfortable position for manipulating the wand. Portion 208 of the handle is intended to be used to carry the cleaner. Control buttons for operating the vacuum cleaner can be provided in region 207. These controls can include an on/off switch, a suction power control etc. as is well known in the art. A bleed valve 209 is also located near to the part of the handle 205 which is used during cleaning. The bleed valve admits air when the trigger 209 is pulled, so as to reduce the suction force at the remote end of the wand.

The hooked projection 220 on the storage tube 165 and hook 130 on the main body both extend for some distance perpendicularly to the longitudinal axis Y – Y' of the storage tube 165. This helps to minimise any rotational movement, or wobble, of the wand about its longitudinal axis. While the hooked projection 220 and catch ring 222 adequately secure the wand to the main body 100, it is preferred to add some further features to the wand 160 and the main body for additional security. Ribs 250 extend radially outwardly from each side of the storage tube 165. Ribs 251 also extend outwardly from the upper face of the separating apparatus 120 at positions adjacent to where the storage tube 165 will lie when it is secured to the main body. The ribs serve to minimise any rotation of the storage tube 165 about its longitudinal axis Y-Y' when the tube is secured to the main body. In short, they minimise 'wobble'. A second rib 255 projects outwardly from the storage tube 165, perpendicularly to the longitudinal axis Y-Y' of the storage tube 165. This locates against a similar rib 125 on the main body 100 and serves to minimise movement of the storage tube 165 in the direction of the longitudinal axis of the tube 165.

In this embodiment, the separating apparatus 120 comprises two cylindrical chambers which lie alongside one another on the main body 100. The hooks 130, 135 are formed on the inlet duct structure which lies between the chambers. This allows the wand 160 to fit more snugly against the main body and helps to reduce the amount by which the wand 160 protrudes beyond the envelope of the main body.

The hose 150 can be stored around the main body 100 of the vacuum cleaner. The hose 150 has a length which is sufficient such that, in use, the main body 100 can sit on a floor surface and the user can manipulate the wand at a convenient height, without any excessive drag. In our embodiment the hose has a length of around 1.5m and a length in the range 1.3 – 1.8m is typical. Conveniently, the hose 150 also has a length which is sufficient to lie once around the perimeter of the main body 100. The hose inlet 151 to the main body 100, as well as being centrally located for ease of pulling, lies below the position where the hose end 168 of the wand 160 will lie when the wand 160 is stored on the main body 100. This allows the hose 150 to form one complete perimeter of the main body 100. Hose retaining features 310 on the main body allow the hose 150 to remain attached to the main body 100 during carrying and during storage.

In the embodiment shown in Figures 2 and 3 a single continuous hose receiving channel 300 is provided along the sides and back of the periphery of the chassis 110. Figure 2 shows the hose 150 in place in the channel 300 and Figures 3A and 3B show the hose removed from the channel 300.

Along most of its length, channel 300 has a semi-circular shape and a diameter which is just greater than the hose 150 that it retains, as shown in Figure 9. This part of the channel 300 defines the storage path for the hose 150 and serves to guide and support the hose 150 when it is stored. At each end the channel 300 there is a hose retaining part 310 which is capable of grasping the hose 150. The hose retaining parts 310 have a shape which is greater than a semi-circle, i.e. the channel extends around greater than half of the circumference of the hose 150. As shown in the cross-section of Figure 10,

hose retaining parts 310 have two leading edges 311, 312. The channel, or at least the hose retaining parts 310 of the channel, are formed from a material, such as polypropylene, which is sufficiently resilient to allow the leading edges 311, 312 to be prised apart to form an opening with a width which is at least equal to the diameter of the hose 150. The material should also be capable of withstanding repeated flexing of this kind over the lifetime of the machine. The entire channel 300, the hose retaining parts 310, or even just the leading edges 311, 312 of the channel can be formed from the resilient material, with the remainder of the channel being formed of a more rigid material. This shape of hose retaining parts 310 allows the hose, once it is fitted within the channel 300, to remain clasped by the leading edges of the channel. The hose can be removed from the channel 300 by applying a force to the hose which is sufficient to overcome the retaining force of the leading edges 311, 312 of hose retaining parts 310. Thus, the hose 150 can be removed in a one handed operation. In a more elaborate alternative scheme, the leading edges 311, 312 of the hose retaining parts 310 can be provided with finger grips by which a user can, with one hand, prise the leading edges apart while the user, with their other hand, pulls the hose 150 from the channel.

While a semi-circular shaped channel is preferred, as it provides continuous support around the hose, the channel could have any shape which provides support at a plurality of points around the hose, e.g. a square or other polygonal shaped structure. Alternatively, a set of ribs can project outwardly from the chassis 110 to define supports for the hose 150. The channel 300 can be integrally formed with the remainder of the main body or it can be formed as a separate part which can then be mounted on the main body during assembly of the machine. The channel 300 can be removably mounted to the chassis 110 so that, if a user does not want this feature they can simply remove the channel 300 from the chassis 110.

The hose 150 has a length which is greater than the perimeter of the main body 100. The main reason for this is to allow some slack around the inlet 151 to the main body and at the hose end 168 of the wand 160 since an excessively tight bend in these regions would

cause damage to the hose. If the hose 150 were to be stored with a tight bend, it could suffer permanent deformation and kinking. Having a hose 150 which is longer than the perimeter of the chassis 110 can result in a user incorrectly fitting the hose 150 to the main body 110. In particular, a user could fit the hose 150 too tightly to the main body at end 151, which would result in an unacceptably tight bend in this region, leaving a large loop of hose at the other end 168 which could hang below the main body 110. In order to instruct a user where to correctly fit the hose 150, hose 150 is provided with a collar 350 which is wider than the diameter of channel 300. This collar 350 is shown in Figures 11A and 11B. The collar 350 serves as a guide for informing a user where to begin fitting the hose 150 into channel 300. As well as visually indicating the correct position for fitting the hose 150, it can be readily located (felt) by a user. Because collar 350 is wider than channel 300, that part of the hose on which collar 350 is fitted cannot be fitted inside the channel. Thus, the hose 150 simply cannot be fitted with an unacceptably tight bend in the region of inlet 151 or wand connector 168. Collar 350 comprises a first collar 351 which has a plurality of radially inwardly extending ribs for engaging with the spaces between ribs on the hose 150. The first collar 351 can be formed as two semi-circular parts which are fitted to the hose 150 by snapping them around the hose in the desired position. A second collar 352 fits around the first collar 351 and holds the two semi-circular halves of collar 351 in place. A small bump feature 353 on the outer surface of first collar 351 corresponds to a small depression on the inner face of second collar 352.

Channel 300 has a shape which causes the hose 150 to follow a sinuous path around the main body 100 of the machine. Expressed another way, the hose storage path is non-planar. From Figures 2, 3A, 3B and 8 it can be seen that the hose 150 begins at the front, lower part of the main body 100, curves around the front of the machine, over the top of the first wheel 112, fitting within the envelope of the machine. After closely following the shape of the wheel, and closely fitting alongside the separating apparatus 120, the hose 150 passes, along a generally convex shaped path beneath a tool storage area on the rear of the machine. On the other side of the machine the hose follows the

same path, before following a gently curving path to the wand connector 168. This layout not only allows the hose 150 to fit neatly within the overall envelope of the machine, but it increases the length of the path, compared to a coil which lies in a single plane, thus increasing the length of hose 150 which can be accommodated. It is noted that the ends of hose 150 are held in position by virtue of connection 151 to the main body and connection 168 to the wand.

The wand 160 itself will now be described in more detail.

Securing mechanisms 400 are capable of either locking the tubes 161, 162, 163 to one another, as is needed when the tubes are in an extended position, or allowing free movement of the tubes with respect to one another, as is needed when the tubes are being retracted. A securing mechanism 400 is provided at the distal end of tube 161 for securing tube 161 to tube 162 and a further securing mechanism 400 is provided at the distal end of tube 162 for securing tube 162 to tube 163. The securing mechanisms 400 automatically lock the tubes, as they are brought to their fully extended position, and automatically unlock as the tubes are retracted.

The detail of these securing mechanisms is not important to the invention. However, for completeness, one embodiment will now be described with reference to Figures 12 and 13. Tubes 162, 163 represent two adjacent stages of the wand 160.

The securing mechanism 400 comprises a ring 410 which fits around the outside of tube 162. The ring 410 comprises a plurality of arms 459 which are connected to, and extend axially rearwardly from, the ring. Between each arm 459 is an arc-shaped part which fits alongside the outer surface of the tube 162. Each of the arms 459 have a radially inwardly extending projection 454 which locates within an aperture in the wall of the tube 162. The arms 459 are pivotable about the ring and the securing mechanism is manufactured from a material which is sufficiently resilient to permit it to flex outwardly and return to the position shown without breaking.

Tube 163 has an inclined surface 470 which serves to move the projections 454 radially outwards as the tubes are brought into an extended position, the projection seating itself in the aperture 420 in the wall of tube 162 and locking the tubes.

To release the tubes 162, 163, the arms 459 flex radially outwardly, pivoting about the ring. This carries the arm 459 sufficiently radially outwardly such that the projection 454 lies radially outside the aperture 420 in the tube. The forward inclined surface 452 of one securing mechanism 400 presses against the rearward surface 456 of another securing mechanism 400 to cause the arm to move in this radial fashion.

A seal 460 is provided on each tube for sealing against another tube. The seal 260 is located at one end of tube 30 and is secured to the inner surface of the tube. The seal 260 can be bonded or clipped in place.

It is preferable for the wand to be lockable with a range of different overall lengths such that users who differ in their physical dimensions (height, arm length) can comfortably use the wand. To satisfy this requirement, the uppermost tube 161 is provided with a set of locking positions, as shown in Figure 6. Conveniently, these locking positions are provided as notches 233 in a ridge which runs along the length of tube 161.

The tubes can be manufactured from a metal such as steel or aluminium, or even a robust plastic material. The tubes are preferably formed from a material of constant thickness, the ridges and channels being formed by shaping the tube. This has the advantage of minimising the weight of the finished product.

In the above embodiment, the securing mechanisms are manufactured from a resiliently flexible material such as a nylon compound. However, an equivalent pivotal movement of the arms can be achieved by manufacturing each arm as a separate part and providing a pivot between each arm and the remainder of the securing mechanism. The resilience

of the arm can be achieved by mounting a spring between the arm and the tube or between the arm and a fixed part of the securing mechanism.

While the above described embodiments show the securing mechanisms 400 as being a separate part from the tubes, a securing mechanism could be manufactured integrally with a tube. A plastic securing mechanism could be moulded (or otherwise formed) around a metal tube, or a plastic securing mechanism could be moulded (or otherwise formed) with a plastic tube.

The operation of the wand will now be described. To extend the wand 160, a user holds storage tube 165 by handle 200 and pulls the narrowest tube 163 axially away from the storage tube 165. Each of the tubes 161, 162, 163 slides outwardly from the storage tube 165. As each tube reaches an extended position with respect to another tube, for example, as tube 163 slides towards the position with respect to tube 162 shown in Figure 12, the tubes automatically lock in this position.

The procedure for collapsing the wand 160 will now be described. A user firstly operates release button 230 on storage tube 165. This releases the catch 232 from tube 161. A user pushes the distal end of tube 163 axially towards the storage tube 165. This causes tube 161 to slide within storage tube 165. Once tube 161 has been fully retracted inside the storage tube 165 the securing mechanism 400 pushes against the leading edge of the storage tube 165 and causes the arms of the securing mechanism 400 to flex radially outwardly, thus unlocking tube 162 from tube 161. Tube 162 then retracts inside the storage tube 165. The complete wand retraction can be performed in one continuous, swift movement without the need for a user to separately operate each securing mechanism 400.

The wand which is shown here has three separate tubes or stages, in addition to a storage tube 165, but it will be appreciated that the wand could have only two stages or

a higher number than three. Each additional stage would have the same type of securing mechanism 400.

Alternatives

Handles

In the previously described embodiment, a single handle 200 is provided which serves for both normal cleaning and carrying. In an alternative embodiment, as shown in Figure 14, a first handle 600 is provided for use during cleaning and a second, separate, handle 605 is provided for carrying the vacuum cleaner.

Another alternative is shown in Figure 15 where a single handle is movable between a first position, for use in carrying the machine, and a second position for use during normal cleaning operations. The handle is pivotable between the two positions and is positively retained in each of the positions. This retention of the handle can be by a locking mechanism which is automatically operated as the handle is moved into the new position, and which is manually released, such as by a user operating a trigger, to release the handle from that position.

In another alternative shown in Figure 16 there is no handle as such for manipulating the wand. Instead, an angled conduit 610 is rigidly (non-rotatably) fixed to the end of tube 165 and this angled conduit 610 serves as a part by which the user can manipulate the wand. The angled conduit 610 can be shaped to provide a comfortable gripping surface, or it can be overlaid by a material which makes the conduit more comfortable to hold. In a still further embodiment, not illustrated, the carrying handle can be omitted altogether. In this case, the main body can be provided with an alternative carrying handle.

Wand storage

In the main embodiment the wand 160 is secured to the main body 100 such that a fairly large proportion of the storage tube 165 of the wand sits above the remainder of the main body 100. It is possible to increase the size of the retaining channel 660 for

receiving the wand, as shown in Figure 17. In this alternative embodiment the receiving channel 660 has a sufficient depth 661 to fully receive the storage tube 165 of the wand, with only the carry handle 200 protruding above the upper surface of the main body 100.

Hose storage channels

The main embodiment described above has a single continuous channel 300 with hose retaining features 310 at each end. There are a number of alternatives to this. As an alternative to providing a single continuous channel 300, there can be multiple, shorter length, channels around the main body. Each of these channels can be provided with a hose retaining function, or just the channels at each end of the set of channels can be provided with this function, the other channels simply serving to define the hose storage path around the main body and to provide a support surface against which the hose 150 can rest, similar to portion 305 of the channel 300.

In an alternative embodiment, the entire channel can have a hose retaining function. Looking again at Figures 2 and 3, this would be achieved by extending the leading edges 311, 312 all the way along the channel. Thus, the channel would have generally the same cross-section all the way along its length.

The channel can be integrally formed with the remainder of the chassis, as shown in Figure 18, or it can be formed as a separate part which can then be mounted on the chassis during assembly of the machine. The channel can be removably mounted to the chassis so that, if a user does not want this feature they can simply remove the channel from the chassis.

A preferable enhancement is for each end of the channel to have a flaired cuff. This permits easy insertion of the hose into the channel. Once a first part of the hose has been inserted into the cuff, a user only needs to push the hose inwardly into the channel to prise the leading edges of the channel apart.

The hose retaining function can be achieved with other types of mechanism. Figure 19 shows individual clips 680 fitted to the periphery of the chassis 110 of the main body. There can be a single clip 680 on each side of the main body, or a number of such clips positioned along the intended hose storage path around the periphery of the main body.

Another form of clip is shown in Figure 20. This is in the form of a clip which can be manually opened or closed. There is a generally semi-circular (or other) shaped support part 650 and a second part 652 which is hingedly connected to the first part 650 or directly to the chassis 110. Part 652 is operable between an open state, in which part 652 opens far enough to allow hose 150 to be inserted into, or removed from, the clip and a closed state, in which the hose 150 is held against part 650. An alternative form of clip would have a pair of arms, each being hinged 655 to a side of support part 650. The arms can extend fully around the hose so as to meet in the middle or can extend only partially around the hose 150. Preferably each arm is sprung loaded (e.g. by a sprung hinge) such that it rests firmly in both the open and closed states. Alternatively, an additional latch can hold the pair of arms together once they are brought into the closed position.

Another form of retaining mechanism is shown in Figures 21 and 22. A plurality of storage rings are positioned around the periphery of the main body 100. The storage rings can be formed of a rigid material or they can be formed of a resilient material, such that ring 690 can be stretched open to receive the hose 150, and return to a position where it fits snugly around the hose 150. Conveniently, the rings 690 can be formed from a rubber compound. To retain the hose 150 on the main body 100, the hose 150 is fed through each of the rings 690 in turn. This is a less desirable solution to what has previously been described as it requires the hose to be separated from the wand to allow the hose 150 to be fed through the set of rings. After feeding the hose through the rings the hose can be connected, once again, to the wand.

In each of these alternative schemes the clips or rings can be fitted to the main body in the same winding path around the body as the hose storage channel of the main embodiment so as to cause the hose 150 to be stored in a sinuous path around the body.

In a still further alternative scheme, shown in Figure 23, the hose 150 is not held in place by clips or a channel which grasps the hose 150. Rather, the hose 150 is held under tension by hooks 681, 682, 683 positioned around the chassis 110 of the main body 100. The hooks 681, 682, 683 are each positioned on the inside of each turn along the path around the body. They define the storage path around the body and they support the hose 150. Each ring has a curved support surface on which the hose 150 can lie. Hook 681 is positioned above the wheel 112, hook 682 is positioned on the rear of the chassis to define the path along the rear of the chassis, and hook 683 is positioned in the same way as hook 681, but on the other side of the chassis 110. It is noted that the ends of hose 150 are held in position by virtue of connection 151 to the main body and connection 168 to the wand.

In each of these embodiments the hose storage path is symmetrical about the longitudinal axis of the main body of the machine. This results from the symmetrical nature of the main body, the machine being symmetrical for good steerability. However, it will be readily understood that there is no need for the storage path on one side to be the same as that on the other side, and the hose storage path can be adapted to fit within available space on each side of the machine.

Hose location collar

In the main embodiment, a collar 350 is fitted around the hose 150 to instruct a user where to fit the hose 150 into the retaining channel. The collar 350 is larger than the hose retaining channel 305 or retaining parts 310. It will be appreciated that shapes of collar, other than a cylindrical collar, could be provided, and additional tactile features such as ribs, or bumps, can be added to the outer surface of the collar 350 to aid a user. Figures 24 - 26 show a range of alternative schemes for instructing a user where to fit

the hose 150 around the main body 100 of the cleaning appliance. In Figures 24 and 25 the hose storage channel and hose location fitting have a corresponding shape which serves to instruct a user where to fit the hose. In Figure 24 the mating shapes are provided by surface 361 at the end of the storage channel 360, and by surface 362 on collar 365 on the hose 150. In Figure 25 ring-shaped cavities 372 are formed at an intermediate position along the storage channel 370. Ring-shaped fittings 371 on hose collar 375 fit within the cavities 372 on storage channel 370.

In addition to mechanical fittings to the hose 150, there are a range of solutions for visually instructing a user where to fit the hose. These can include a pattern, such as arrows or stripes, or simply coloured markings on the hose. The visual markings can be incorporated into the hose itself or they can be applied after manufacture, such as by applying a label or transfer to the outside of the hose or by painting the hose. Figure 26 show visual markings 378, 379 on collar 350 and the end of storage channel 380.